

~~Protein involved in restoration of cytoplasmic male sterility  
to fertility and gene encoding the protein and gene.~~

**PROTEIN INVOLVED IN RESTORATION OF CYTOPLASMIC MALE  
STERILITY TO FERTILITY AND GENE  
ENCODING THE PROTEIN**

**CROSS-REFERENCE TO RELATED APPLICATIONS**

This application is a Continuation-in-Part of International Application No. *PCT/JP02/04092*, filed April 24, 2002, which was not filed in English under PCT Article 21(1), ~~and which claims priority of Japanese Application Nos. 2001-128008, and~~ which claims priority of Japanese Application Nos. 2001-128008, filed April 25, 2001, 2001-202082, filed July 3, 2001, and 2002-20083, filed January 29, 2002. The disclosures of each of these applications is incorporated by reference herein in ~~their entireties~~ its entirety.

This application is a Continuation-in-Part of United States Application No. *10/451,366*, filed April 24, 2002, now abandoned, which is a national stage of International Application No. *PCT/JP02/04092*, filed April 24, 2002, which was not filed in English under PCT Article 21 (1) , ~~and which claims priority of Japanese Application Nos. 2001-128008, and~~ which claims priority of Japanese Application Nos. 2001-128008, filed April 25, 2001, 2001-202082, filed July 3, 2001, and 2002-20083, filed January 29, 2002. The disclosures of each of these applications is incorporated by reference herein in ~~their entireties~~ its entirety.

**Technical Field**

The present invention relates to a gene involved in restoration from cytoplasmic male sterility to fertility. More specifically, the present invention relates to the gene involved in ~~restoration of cytoplasmic male sterility character~~ in restoration of cytoplasmic male sterility character (hereafter may be abbreviated to ems) used for developing a cultivar of a first filial hybrid (hereafter abbreviated to FI), and a vector and a transformant containing the gene.

**Background Art**

As to crops such as cereal crops and vegetables, F1 cultivars are being actively developed with features such as 1) an

agricultural genetic character improved excellently by heterosis, 2) an equal quality of harvests, and 3) protectability of a breeder's right on the basis of segregation of genetic characters in the next generation. Actually,  $F_1$  varieties of many major crops have gone into actual use.

A method for seed production of an  $F_1$  cultivar is exemplified by cms/Rf seed production system comprising a cytoplasmic male sterile (cms) line and a line (hereafter may be abbreviated to Rf) for restoration from male sterility of the cultivar. For example, the method has been developed for cereals such as rice, Sorghum, and corn and an oil crop such as sunflower. These methods have been developed by using a technique of breeding or cell fusion.

For Brassicaceae, the system for  $F_1$  seed production by applying self-incompatibility is widely applied. For rapeseed showing unstable self-incompatibility, however, the system for  $F_1$  seed production requires use of the cms line and the Rf line.

On the contrary, in recent years, a study has been conducted for using cytoplasmic male sterile line (Kosena cms) derived